



# **Turbine Power Systems Conference**

## **February 25-26, 2002**

### **Power Industry Vision for Predictive Maintenance**



## **Challenge - Market Demands**

- **Low Production Costs**
- **High Reliability**
- **Cost of Purchasing Replacement Power**
- **Profit Gained by being in a position of selling power during peak demand**



## **Challenge - CT/CC Operations**

- **CT Plants are Minimally Staffed or are have no Staffing**
- **Logistics - CT Plants are part of a Fleet and are Managed from a Central Location**
- **CT Plants are used Primarily for Peaking and can be called on at anytime**
- **CT Plants sit idle for long periods.**
- **CC Plants are similar to Steam Plants but have less Staffing**

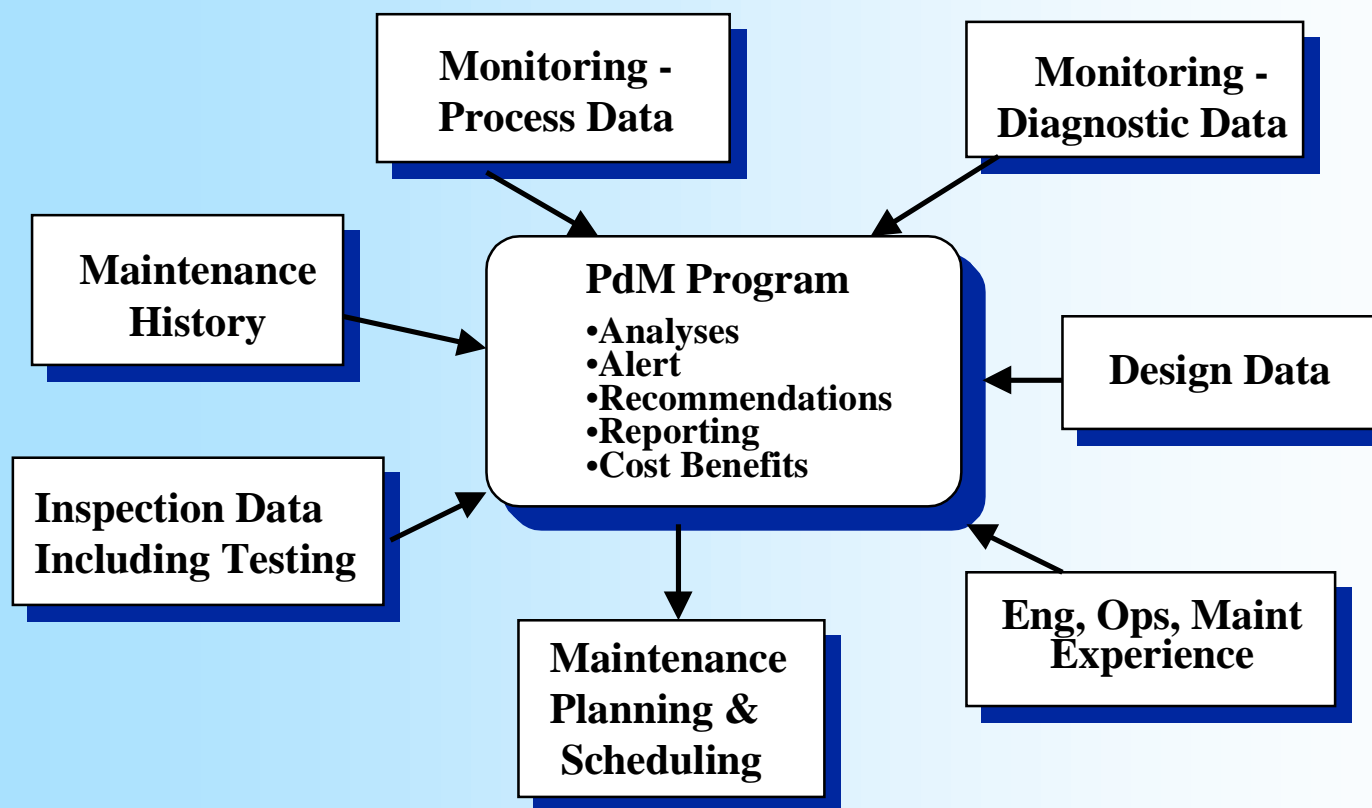


# CT/CC Plant Equipment

- **Primary Equipment**
  - **Combustion Turbine**
  - **HRSG**
  - **Steam Turbine**
  - **Generator**
- **Balance of Plant Equipment**
  - **Fuel Storage and Delivery**
  - **Starting System**
  - **Distribution System**
  - **Cooling Water System**
  - **etc**

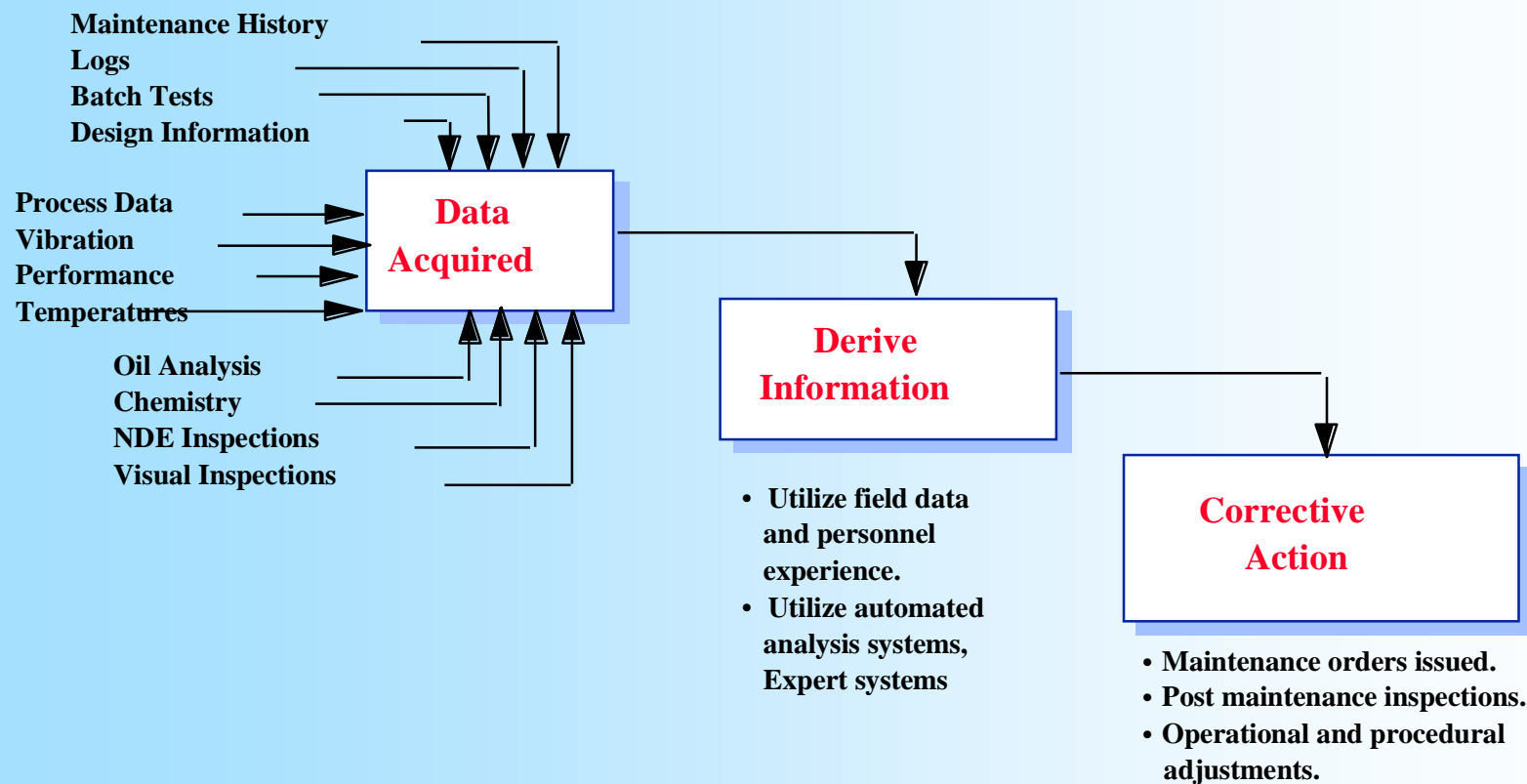


# Predictive Maintenance Program





# Predictive Maintenance Program





# Predictive Maintenance Program

- **Use All Available Condition Indicator Data**
- **Condition Indicator Data Includes:**
  - **Condition Monitoring Data**
  - **Inspection Data**
  - **NDE Data**
  - **Repair Data**
  - **Maintenance Experience**
  - **Design Data**
  - **Operator Logs & Rounds**
- **Integrated Data to determine Equip. Condition**



# CT/CC Monitoring Modes

- **Continuous - Primary Equipment**
- **Periodic - Balance of Plant Equipment**
- **Transient**
  - startup
  - shutdown
  - alarm driven
- **Batch Testing & Special Requests**
- **Pre-Overhaul Evaluation**





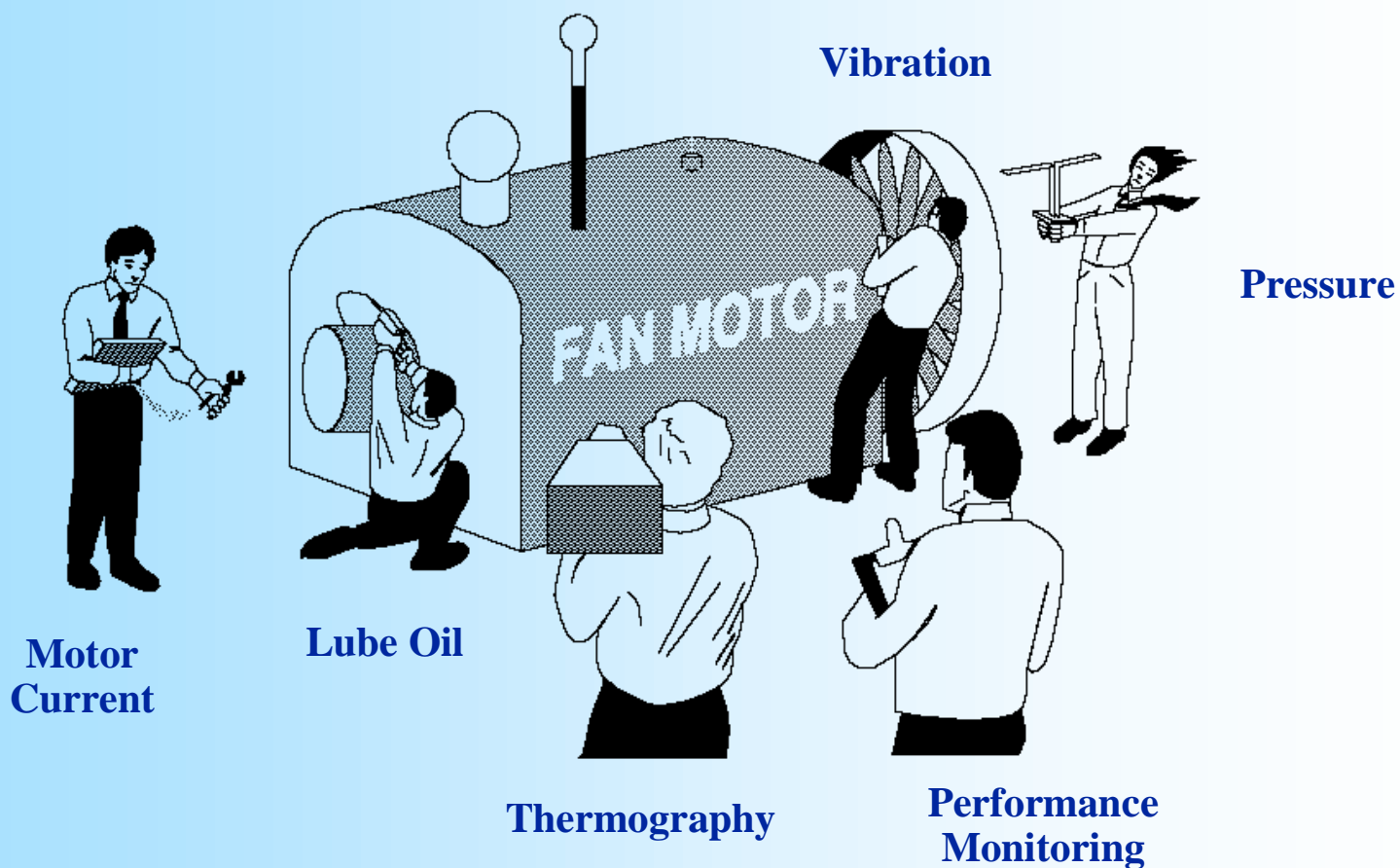
# Continuous Condition Monitoring Systems

- **Combustion Turbine**
  - Life Management Monitoring (LMP, Coatlife)
  - Reliability Monitoring (ORAP-Link)
  - Performance Monitoring
  - Continuous Vibration Monitoring
  - Process Data Monitoring
  - Pyrometry
- **HRGS**
  - Water Chemistry
- **Steam Turbine**
  - Continuous Vibration Monitoring
  - Performance Monitoring
  - Process Data Monitoring



# Balance Of Plant Condition Monitoring Technologies

To Control Room  
(Process)





# Periodic Condition Monitoring Systems

- **Thermography (Spot Radiometer, Contact Pyrometers)**
- **Periodic Vibration Monitor**
- **Lube Oil Monitoring**
- **Acoustic Leak Detection**
- **Electric Motor Predictive Maintenance**
  - **Motor Current Analysis**
  - **Off-Line Electrical Testing**
- **Valve Diagnostics**

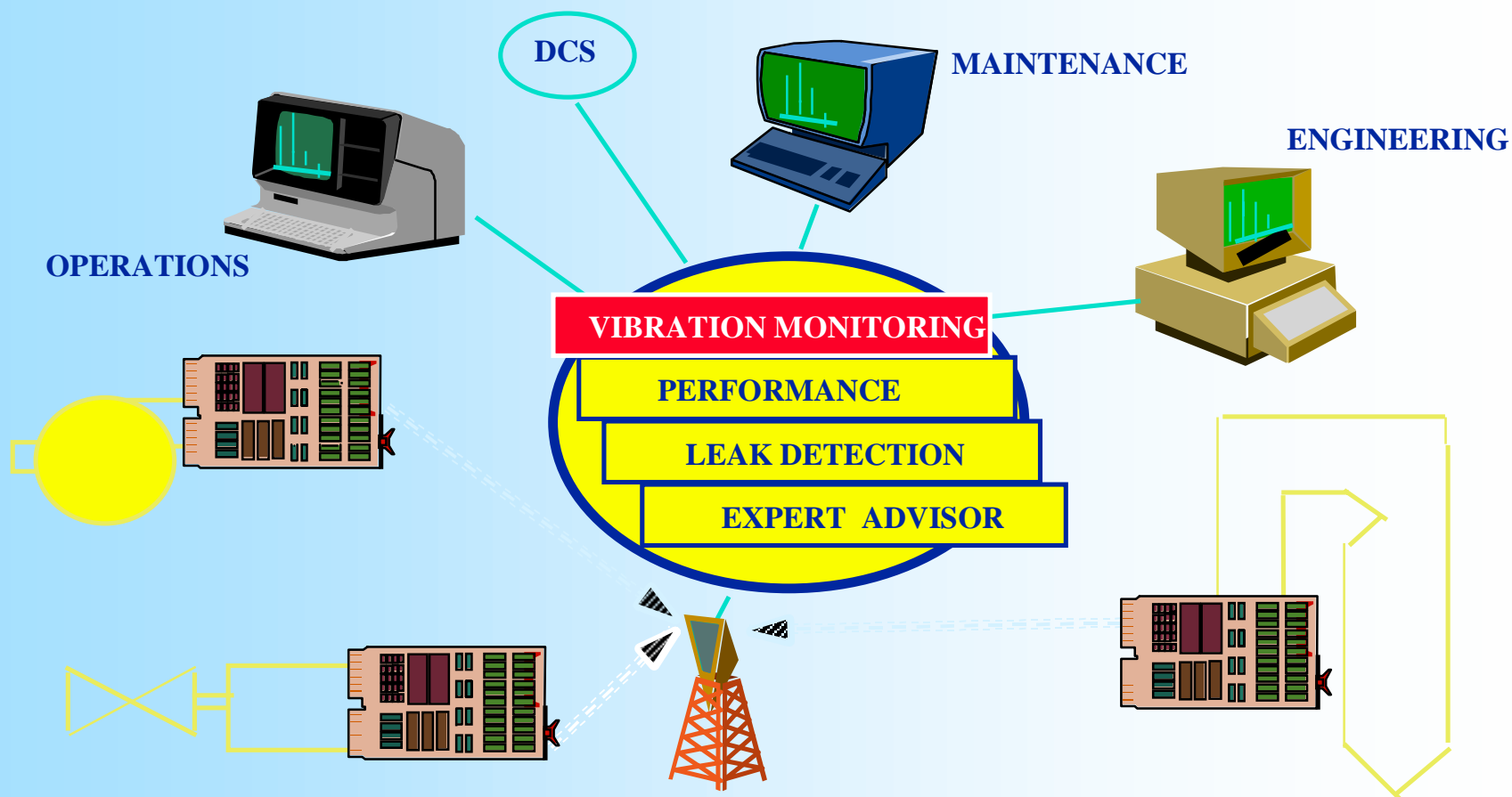


# Vision - Technology Integration

Next Generation



Standardization



EPRI



# **Vision - Technology Integration**

- **Continuous Diagnostic/Prognostic Monitoring (DOE/EPRI)**
- **Wireless Sensors**
- **Standard Data Acquisition**
- **Remote Access of Condition Monitoring Data**
- **Integrated Analysis**
- **Expert Advisors**



# Vision - Remote Access & Analysis Enterprise Process Information System

Web-Based using the Intranet and Internet

